

What is claimed is:

1.           An electronic device comprising:  
            a substrate;  
            a bump of a first metal material provided on  
a surface of the substrate;  
            a bonding film of a second metal material  
provided on a top surface of the bump for bonding the  
electronic device to an electrical connection portion  
of a second device, the second metal material having a  
lower melting point in an elemental state than an alloy  
of the first metal material and the second metal material;  
and  
            a diffusion prevention film of a third metal  
material provided between the top surface of the bump  
and the bonding film as covering at least part of the  
top surface of the bump, the third metal material having  
a lower diffusion coefficient than the second metal  
material with respect to the first metal material.
2.           An electronic device as set forth in claim 1,  
wherein  
            the diffusion prevention film covers the entire  
top surface of the bump, and  
            the bonding film is entirely disposed on the  
diffusion prevention film.
3.           An electronic device as set forth in claim 1,

wherein

the diffusion prevention film covers a part of the top surface of the bump and uncovers the rest of the top surface, and

the bonding film has a portion present on the diffusion prevention film and a portion contacting the top surface of the bump.

4. An electronic device as set forth in claim 1, wherein

the substrate is a semiconductor substrate, and the electronic device is a semiconductor chip.

5. An electronic device as set forth in claim 1, wherein

the substrate is a wiring board having a wiring conductor provided on an insulating substrate, and

the bump is provided on the wiring board and connected to the wiring conductor.

6. A semiconductor device of a chip-on-chip structure comprising a first semiconductor chip and a second semiconductor chip respectively having bumps and connected to each other with the bumps thereof bonded to each other, wherein

at least one of the first semiconductor chip and the second semiconductor chip is an electronic device as recited in claim 4.

7.           A semiconductor device comprising:  
              a wiring board having a wiring conductor  
provided on an insulating substrate; and  
              an electronic device as recited in claim 4, the  
electronic device being connected to the wiring conductor  
with a bump thereof opposed to the wiring board.
8.           A semiconductor device production method for  
producing a semiconductor device by bonding a  
semiconductor chip onto a semiconductor substrate via  
a bump,  
              the bump being provided on a surface of at least  
one of the semiconductor substrate and the semiconductor  
chip, and composed of a first metal material,  
              the bump having a bonding film of a second metal  
material provided on a top surface thereof, the second  
metal material having a lower melting point in an elemental  
state than an alloy of the first metal material and the  
second metal material,  
              the bump further having a diffusion prevention  
film of a third metal material provided between the top  
surface of the bump and the bonding film as covering a  
part of the top surface of the bump and uncovering the  
rest of the top surface, the third metal material having  
a lower diffusion coefficient than the second metal  
material with respect to the first metal material,

the bonding film having a portion present on the diffusion prevention film and a portion contacting the top surface of the bump,

the method comprising the steps of:

temporarily bonding the semiconductor chip onto the semiconductor substrate with the semiconductor chip being placed on the semiconductor substrate with the intervention of the bump by heating the bonding film at a first temperature which is not lower than the melting point of the second metal material in the elemental state and lower than the melting point of the alloy of the first metal material and the second metal material; and

firmly bonding the semiconductor chip onto the semiconductor substrate after the temporary bonding step by heating the bonding film at a second temperature which is not lower than the melting point of the alloy of the first metal material and the second metal material.

9. A semiconductor device production method as set forth in claim 8, wherein

the firm bonding step is performed after a plurality of semiconductor chips are temporarily bonded onto the semiconductor substrate.